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OBSERVATIONS
ON THE
USE OF THE STETHOSCOPE
IN THE
DIAGNOSIS AND TREATMENT
OF
DISEASES OF THE CHEST.

A Probationary Essay

PRESENTED TO THE FACULTY OF PHYSICIANS AND SURGEONS, GLASGOW.

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OBSERVATIONS, &c.

THE Stethoscope was first used by Lænnec, in the year 1816, and the first edition of his work on the diseases of the chest made its appearance two years afterwards. Since that period, such has been the enthusiasm excited by the new method of diagnosis, that the first pathologists of the day have been induced to turn their attention more particularly to the diseases of the chest. Consequently, during the short period of seventeen years, more light has been thrown upon the pathology of the lungs and heart, than had been by the investigations of all the preceding authors, taken conjointly. Several morbid appearances, which were before unknown, have been accurately described, traced to their causes, and found to give rise to certain signs, by which they are cognizable during life. So that, instead of our having, as formerly, only a few diseases of the lungs and heart, with their definitions, to take into consideration, we have a complete list of all the morbid states of the organs, along with a minute description of their different symptoms, both general and stethoscopic.

Lænnec has, in a great measure, had the merit of introducing this manner of studying disease,—I mean that of first ascertaining all the different morbid states of an organ, and then attempting to find out whether they give rise to any sign or signs by which they can be detected during life. For instance, instead of being contented with the terms pneumonia or phthisis, it is better to know the exact state of the lung, and make use of the terms engorgement, hepatization, suppuration, tubercle or tuberculous excavation; because

although these be only different stages of diseases, yet our treatment is materially affected by a knowledge of them. Were a medical man to examine the chest of a patient, and finish by simply pronouncing the disease to be phthisis; this would not be considered sufficient in the present day. We must know where the tubercles are, and to what extent they exist; whether they be in a crude state, or have gone on to suppuration; and if there be tuberculous excavations, we ought to know their number, size, and situation, so as to be enabled to tell the patient whether he ought to try the effects of a warm climate. Had these points been more particularly attended to, many poor patients who have died on their way to Italy, or soon after their arrival, would have been saved the trouble and expense of a long and fatiguing journey.

This manner of studying disease has been extended to all the other internal organs, and particularly to the alimentary canal; consequently, we no longer make use of the term dyspepsia, but in its place we have a list of all the morbid conditions to which the alimentary canal is subject. Various means have been had recourse to, and several circumstances connected with the functions of the different organs have been minutely studied, in order to render the diagnosis as accurate as possible. In the diseases of the abdominal viscera, much may be done by manual examination and percussion;—in those of the brain, by minute attention to the partial or complete paralysis of the different parts of the body, the appearance of the eye, and the state of the intellectual powers; in those of the heart, by studying the sound and impulse which accompany its action; and in those of the lungs by marking the different kinds of sound produced by the air pervading the substance of the organ. The study of the various kinds of sound which accompany the healthy and diseased actions of the lungs and heart, forms the subject of this essay, and we shall see how far it tends to correct our diagnosis, and render our treatment scientific.

In order that the lungs may perform their function perfectly, it is necessary that they be pervious to air throughout their whole extent. The slightest deviation from the healthy state

gives rise to more or less obstruction to this free transmission of air, and the danger in all the diseases of the lungs is in proportion to the extent of lung rendered impervious. Phthisis proves fatal with a rapidity proportioned to the consolidation or destruction of the lungs, consequent on the progress of tubercles. In pneumonia, the severity of the symptoms depends on the extent of the engorgement or hepatization; in emphysema, on the degree to which the air cells are ruptured; in bronchitis, on the closing up of the bronchial tubes, either from thickening of the mucous membrane, or the secretion of viscid adhesive matter; and in pleuritis, on the compressed state of the lung consequent upon the effusion of fluid. Much also depends on the rapidity with which this obstruction is produced. A patient may live with only one lung, if the destruction be brought on gradually, as in phthisis, or melanosis; but if the whole lung be suddenly obstructed in consequence of an attack of pneumonia, bronchitis, or pleuritis, it generally proves fatal.

Since, then, so much depends upon the lungs being pervious to air throughout their whole extent, it comes to be a matter of great importance, to find out some means by which this condition of the organ may be known during life. The discovery of Lænnec has put us in possession of a method by which this may be effected with great accuracy.

In order to form an idea of Lænnec's method of examining the lungs, we may suppose the organ divided into three parts. First, the bronchial tubes; second, the air cells; and third, the pleura. Auscultation is the examination of the different kinds of sound produced by the air, and the resonance of the voice and cough traversing these parts. The air enters into every part of the two first of these structures, but not at all into the last, consequently our diagnosis in diseases of the pleura is not so perfect as in the diseases of the lung itself. The resonance of the voice, however, is of great service in distinguishing the diseases of the pleura, as will be afterwards shown.

In order to explore the chest thoroughly, it is necessary to examine the patient while he is in the performance of the

three following acts :—1st, breathing ; 2d, speaking ; and 3d, coughing.

With regard to the *respiration* ;—when the ear is applied to the healthy chest, either directly or through the medium of a wooden cylinder—a stethoscope, or any other substance which is a good conductor of sound, a noise is heard, at the moment of inspiration, somewhat similar to that of breathing. This noise is caused by the air passing through the lungs. It is much louder in some parts than in others, in consequence of the difference in the size of the bronchial tubes in different parts of the lungs. If the stethoscope be applied over the trachea, the sound is so loud as to resemble snoring ; if it be applied to the situation of the root of the lung at the side of the spinal column, the sound, though not so loud as over the trachea, will be found to be much more harsh than when the instrument is applied over a part of the lung where no large bronchial tube exists. In proportion as we approach the minute structure of the lung, the harshness of the sound diminishes. If this healthy respiratory murmur be studied minutely it may be perceived to consist of two distinct sounds :—viz., a noise similar to that of breathing, and an extremely minute crepitation. The former is caused by the air pervading the bronchial tubes, and the latter by the air dilating the air cells or minute structure of the lung. These two sounds may be named bronchial, and vesicular. They take place at the same time or nearly so, and have consequently been considered as one, and termed the *natural respiratory murmur*. It is somewhat difficult to perceive this distinction at first ; but after the ear has been for some time accustomed to auscultation, it is not difficult, and when the sounds have been once heard, they are very easily recognized. This division is of great importance in a practical point of view. In the first stage of phthisis, the minute structure of the lung is so thickly studded with small tubercles that the air cannot enter it, while the bronchial tubes remain pervious to a considerable extent. On examining such a case with the stethoscope, the respiratory murmur will be found to have lost its vesicular

character, and have become harsh and entirely bronchial. This is in general the first stethoscopic sign which tubercles give rise to, and is frequently to be observed before cough or the other general symptoms have appeared.

Having fully ascertained the character of the respiratory murmur in a healthy well-formed chest, it remains to be seen, how far this sound is modified or changed, by the various morbid states of the organ. When the mucous membrane of the bronchial tubes is thickened as in bronchitis, the natural respiratory murmur is changed into a loud harsh noise approaching to that of snoring. If the minute bronchial tubes be partially obstructed by viscid mucus, a variety of sounds is heard, similar to the chirping of birds, the cooing of doves, &c. Again, when the tubes contain pus, or fluid of any kind, a gurgling noise is heard similar to the rattle which often takes place in the trachea, shortly before death. When any part of a bronchial tube is dilated, or when a cavity exists in any part of the lung, then the rattle produced by the motion of pus in the tubes assumes a hollow sound, and has from this circumstance been called the *cavernous rattle*. In very severe cases of acute bronchitis or croup, the tubes are filled up by a false membrane, and consequently no respiratory murmur whatever is heard.

The minute structure of the lungs is also subject to several morbid changes, which modify, to a very great degree, the natural respiratory murmur. When the substance of the lung becomes engorged with blood, as in the first stage of pneumonia, the healthy vesicular crepitation becomes loud and exactly resembles the noise produced by the crepitation of common salt when thrown upon a red hot iron. When the air cells are ruptured, and large vesicles filled with air have formed on the surface of the lung, as in emphysema, a dry crepitating noise is heard not unlike that produced by pressing upon a dried bladder partially inflated. When the minute structure of the lungs is obstructed or solidified by hepatization, tubercles, or melanosis, then the respiratory murmur ceases to be heard; but if the obstruction be only partial, the murmur is then only diminished in its intensity.

From this short view, it may be seen how far the study of the respiratory murmur, and its various modifications, is of importance in the diagnosis of the diseases of the lungs.

Another circumstance which assists us very considerably in our diagnosis, is the resonance of the *voice* and *cough*. If the stethoscope be applied to a healthy well-formed chest, it will be observed, that while the person is in the act of speaking or coughing, a certain resonance takes place at the bottom of the instrument. The sound does not seem to enter the tube of the instrument, but merely to be spent on the surface of the chest. It is produced by the sound of the voice or cough passing to a certain extent along the bronchial tubes, consequently, it is loudest in those parts of the lungs where the large tubes exist. By applying the palm of the hand to the surface of the chest, it will be felt that the voice produces a distinct vibration in that situation. This resonance, like the respiratory murmur, exists all over the lungs. It is much stronger, however, in a full, than in a weak contracted chest. It may be increased or diminished, changed in its nature, or completely destroyed by disease. In cases of hepatization or tubercles, when the minute structure of the lung is obliterated, leaving the bronchial tubes free, this resonance is greatly increased, and seems to enter the tube of the stethoscope, constituting the sign called *bronchophony*. If in such cases the disease has gone the length of partially obliterating the bronchial tubes, then the resonance is diminished. When there exists a cavity in the substance of the lung, whether resulting from tubercles, inflammation, or the dilatation of a bronchial tube, this resonance is changed in its character. It is no longer a simple resonance or vibration at the bottom of the stethoscope, for the sound strikes against the membrana tympani, sometimes so strongly as to prove disagreeable, and the words are heard to be distinctly articulated within the tube of the instrument. This has been called *pectoriloquy*. In cases of pleuritis, when there is a small quantity of fluid effused into the cavity of the pleura, the resonance is also considerably modified. It is evident that in such cases there

is a layer of fluid interposed between the stethoscope and the lung. The resonance, in passing through this fluid, is changed in its character, and assumes a shrill tremulous sound, resembling, in a slight degree, the bleating of a goat. It is more like an echo of the voice, than the voice itself. This sign has been termed *ægophony*. When an abscess or vomica of the lung bursts into the cavity of the pleura, the air passes from the bronchial tubes into this situation, and the lung collapses, so that a large cavity is formed between the pleura pulmonalis, and the pleura costalis, filled partly with pus, and partly with air, and communicating, by means of a fistulous opening, with the cavity in the substance of the lung. During respiration, or on coughing, pus or mucus is often thrown from the lung into this large cavity; and if the stethoscope be applied at this moment, a noise not unlike the ticking of a watch, will be heard. This peculiar sound has received the name of *metallic tinkling*. It may be heard in all very large cavities. Metallic tinkling is generally indicative of pneumo-thorax; it is also frequently heard in very large tuberculous excavations. It is necessary, however, that the cavity be extremely large and nearly empty. Metallic tinkling has been likened by Lænnec, to the sound emitted when a grain of sand is dropped into a glass vessel. When the cavity is very large and empty, instead of metallic tinkling, we have a sound similar to that produced by blowing into a flask or bottle, caused by the air passing into the cavity of the pleura.

Coughing, independent of its resonance, is sometimes of great use in the exploration of the chest. It occasionally happens, when a cavity has only one or two bronchial tubes opening into it, that these tubes are obstructed by pus or mucus, and till the person cough so as to clear these openings, none of the signs of a cavity can be heard. In cases of purulent infiltration of the lung also, the act of breathing is not sufficient to impel the air through the purulent matter, so that during inspiration nothing is audible; it becomes necessary in such cases to make the patient cough several times before we can form our diagnosis. In dry catarrh, and chronic

affections of the bronchial tubes, we frequently find the respiration scarcely audible. In such cases, if the person cough two or three times, the inspiration which follows each cough will be distinctly heard. I have seen many instances in which no respiratory murmur was perceptible, excepting after the cough.

From this very short sketch of Lænnec's manner of examining the lungs, it may be seen how far the diagnosis of the different morbid changes to which the bronchial tubes, the parenchymetous structure, and the pleura are subject, is rendered complete. We may see that scarcely any morbid change can take place in the bronchial tubes or minute structure of the lungs, without affecting the respiratory murmur or resonance of the voice, or cough, in such a manner as to be detected by the use of the stethoscope. As to the diseases of the pleura, there is still considerable obscurity; but this is not to be wondered at, when we consider that the air does not traverse that membrane, excepting in cases of pneumothorax. We can detect inflammation of the bronchial tubes, or parenchyma of the lungs from the sound which the air produces in passing through them, but we have no means of judging of inflammation of the pleura, unless some morbid secretion has taken place. When fluid exists, to a moderate degree, in the cavity of the pleura, then we have ægophony; but the question comes to be, whether pleuritis can exist without effusion. Lænnec was of opinion, that in almost every case of pleurisy, fluid is effused within a few hours after the attack; so much so, that in all his experience, he seldom saw a case in which he did not find ægophony at the very commencement. A very small quantity of fluid is sufficient to give rise to this sign; from three to four ounces may be easily detected.

Notwithstanding the high authority of Lænnec, I believe that many cases of pleurisy occur, in which the quantity of fluid effused is so trifling as not to give rise to ægophony; only a very minute quantity of albuminous matter is secreted, which becomes solid in a few days, and produces adhesion of the two surfaces of the pleura. Seven years

ago, while I resided as clerk in the Royal Infirmary of this city, I had numerous opportunities of studying pleuritis, and of making dissections of the disease in all its stages. During the winter of 1826—27, the greater number of the cases of fever, admitted into the house, experienced an attack of pleuritis at one period or other of the disease. In general this attack was of a slight kind, lasting only eight or ten days, and accompanied by considerable pain on inspiration, at the lower and back part of the chest. Most of the cases were examined by the stethoscope, but ægophony was heard only in a very few of the most severe. On examining such cases, I frequently heard a peculiar kind of rattle, which is not described by Lænnec. It resembles as nearly as possible, the sound produced by rubbing a quantity of hair between the finger and thumb. It is very distinct, and seems as if it were produced at the very surface of the chest, so much so, that the first time I heard it, I thought it might have been caused by the rubbing of the stethoscope upon the skin. I afterwards thought that it depended upon emphysema of the lung, but its occurring so frequently in those cases in which I expected to find ægophony, and its being always most distinctly heard in the situation where the stitch was most painful, and where there was even pain or pressure, made me suspect that it was connected with some affection of the pleura. After some time, we had several opportunities of inspecting such cases, in consequence of death from fever, and in all of them we found recent adhesions of the pleura. Two cases happened to die of the fever at the time when the rattle was very distinct, and on inspection, a thin layer of albuminous matter was found between the two surfaces of the pleura, which were in some points adhering, but which could be separated by the slightest pressure. On separating the two surfaces of the pleura, the substance which served to unite them presented at some parts a cellular appearance, and gave rise to a crepitating noise, not unlike that heard through the stethoscope before death. From inspection of these cases at various stages, it appeared that soon after the attack, a thin layer of albuminous fluid, not unlike

the white of an egg, but of a light straw colour, was secreted. The more fluid part of this secretion was in a few days absorbed, and before adhesion took place, it presented a dry, cellular appearance. This, I believe, is what takes place in all slight attacks of pleurisy, which terminate in adhesion, without producing any very marked derangement of the constitution.

From numerous dissections it appeared very clearly, that the cause of the dry crepitating superficial rattle observed on examination with the stethoscope, was the presence of a quantity of albuminous matter between the two surfaces of the pleura. During inspiration, the lungs are expanded and pressed against the ribs, consequently, if any crepitating substance be interposed between the two surfaces of the pleura, a certain noise will be produced. Lænnec was of opinion that during respiration the lungs moved slightly upwards and downwards, and if this be true, the phenomenon is easily explained; but it appears to me that the dilatation and contraction of the lungs are sufficient to produce it. In emphysema, when large vesicles filled with air are formed on the surface of the lungs, we find that the motion produced by the expansion and contraction of the lungs is quite sufficient to give rise to a particular kind of rattle; and this being the case, I do not see why the presence of a certain substance between the two surfaces of the pleura may not also give rise to a similar phenomenon. Let the explanation, however, be what it may, the fact remains the same; viz., that a certain noise was heard in a particular part of the chest, during life; and that a certain diseased appearance was found in that same part of the chest, after death. Since I left the Glasgow Infirmary, I have frequently had opportunities of observing this disease in the wards of the Parisian hospitals, and of pointing out the circumstance to some of my friends who were enthusiasts in the use of the stethoscope. In no case was the sign observed, without finding on dissection, either recent adhesions, or deposition of albuminous matter. Thus we see, that although the air does not enter the cavity of the pleura, we have two signs by which inflammation of the membrane

may be detected ; one, the peculiar rattle just described, indicative of slight inflammation, with secretion of albuminous matter : and the other, *ægophony*, indicative of effusion of fluid to a considerable extent.

The stethoscopic examination of the heart is much more easy than that of the lungs, inasmuch as the signs are louder, better defined, and fewer in number. When the stethoscope is applied to the region of a healthy, well-proportioned heart, the beat is very distinctly heard. If the beat of the heart be listened to attentively, it will be easily perceived to be double, followed by an interval of repose. The first part of the beat, or rather the first beat, is synchronous with that of the arterial system, and marks the contraction of the ventricles ; the second beat follows the first so rapidly, as to seem almost a continuation of it, and is much shorter in its duration, occupying only half the time. This second beat was supposed by Lænnec to be caused by the contractions of the auricles : but it has been, since his death, very satisfactorily shown, that it marks the dilatation of the ventricles. The interval of repose which succeeds the second beat is also of short duration, being only half that of the first. If the time taken up by the two beats and the repose be divided into four parts, two will be found to be occupied by the first beat, one by the second, and one by the instant of repose. This then is the *rhythm* of a healthy well-formed heart. But besides this, there are other two circumstances to be observed in the healthy action of the heart ; viz., the *sound*, and the *impulse*.

The *sound* which accompanies the heart's action is of a dull kind, and not very loud. The *impulse* is the slight shock experienced by the ear or hand at the instant of the contraction of the ventricles. When the heart is in a healthy state, and acting quietly, neither the sound nor the impulse are perceptible beyond the cardiac region.

Thus we have three undoubted facts to go by in the examination of the heart, viz., the *rhythm*, or relative proportions of time taken up by the beats and repose ; the *sound* which the action of the heart produces, and the *impulse* or force

with which it strikes against the ribs. If, on examining the heart, we find these three signs in their natural state, we may rest assured that there can be no organic disease of the part. This is certainly a great point gained in the diagnosis; but it is not all, for it has been ascertained by numerous and careful dissections, that the different organic diseases of the heart so modify or change these three phenomena, as to render it easy by means of the stethoscope to form a very correct diagnosis in all cases. For instance, when the heart is hypertrophied, the impulse is greatly increased, being sometimes so strong as to elevate the head of the examiner an inch or two at every beat; the rhythm is also proportionably affected. On the other hand, when the heart is dilated the sound is greatly increased, and is frequently so loud as to be heard at the posterior part of the right side of the chest. When the valves are so diseased as to offer obstruction to the free circulation of the blood, the natural sound is accompanied by noise similar to that produced by the blowing of bellows, or the sawing of wood. It may even be ascertained which side of the heart is affected, by the situation in which the sign or signs are heard most distinctly.

In almost all the diseases of the lungs and heart, *percussion* of the chest is of great use in enabling us to form a correct diagnosis. A healthy chest, when struck with the points of the fingers, emits a hollow sound excepting in the situation of the heart. In proportion as the lungs become solid from the presence of tubercles or hepatization, or collapsed in consequence of fluid in the cavity of the pleura, this sound becomes dull and fleshy. When the heart is enlarged, or when fluid is effused into the cavity of the pericardium, the sound becomes dull over a larger space than the cardiac region. As a general rule it may be said, that when the respiratory murmur is good, the sound on percussion is good. Emphysema, however, forms an exception to this rule; for while the sound on percussion is increased, the respiratory murmur is diminished in loudness. I have frequently observed, that when there is a large cavity in the lungs, and particularly if it be near

the surface, percussion emits a very peculiar sound, which is with difficulty described. Instead of its being the hollow sound of the healthy chest, I would say that it is somewhat metallic, and conveys the idea of the sound emitted by a cracked earthen vessel, compared to that by an entire one. I have observed this sound so frequently, that I consider it a sure sign of a large cavity, or a number of smaller ones communicating with each other.

Such then is a very short and condensed view of Lænnec's manner of examining the diseases of the lungs and heart. It was not the intention of the author to enter minutely into the subject, but only to expose the method so far as to show that there is no charlatanism connected with the use of the stethoscope, as has been supposed by some, but, that on the contrary it is founded on sound philosophic principles; this must be admitted by every one who devotes the slightest attention to the subject.

It is evident that auscultation has put us in possession of a new class of symptoms, much more infallible in their nature than the general symptoms, in as much as they are caused by the action of the organ itself, and are so intimately connected with the state of the organ, as to be materially affected by the slightest change in its structure. They have hence been very justly called the *physical signs*. Some have, however, doubted that the stethoscopic signs are sure and invariable indications of the different morbid states. This is a point which no argument or train of reasoning can decide; it is only by referring to the facts recorded by the different authors who have written on the subject, or by examining disease for ourselves, that we can arrive at any thing like a conclusion on this subject. In the Parisian hospitals, where the use of the stethoscope is taken advantage of in every case of disease of the lungs or heart, the physicians are regularly in the habit of predicting the diseased appearances before the body is inspected, and it very seldom happens that they are wrong. In most of the hospitals of this country the same thing is now done, and with great accuracy. Were the stethoscopic signs not sure

indications of the different morbid appearances, this could never be done. These different signs have been made out gradually, by a system of carefully noting down the symptoms during life, and comparing them with the diseased appearances after death ; and so accurately has this been done by Lænnec, that notwithstanding the number of men of talent and industrious habits who have turned their attention to the subject, none of the signs have been found erroneous. Although the stethoscopic signs were made out by observation alone, yet now that we know them, they appear so simple and rational, that we are astonished they were not discovered long before Lænnec's time. There can be no difficulty in seeing why the air, in passing through a bronchial tube or cavity containing pus, will give rise to a gurgling noise, for this can be easily imitated by blowing into any tube containing fluid. It is equally easy to see how the resonance of the voice may be increased to pectoriloquy, by the existence of a cavity in the lungs ; or how the natural respiratory murmur may be accompanied by a moist crepitating noise, when the minute structure of the lung is engorged with blood, as in the first stage of pneumonia ; or how an emphysematous state of the lung will give rise to a dry crepitating rattle. In short, all the signs seem to have a rational connexion with the morbid states which they indicate, so that when they are once known they are easily recollected.

It has been said that auscultation is unnecessary, and that the general symptoms are sufficient in every case to enable us to form an accurate diagnosis. Were the lungs and heart subject to no other diseases than those mentioned in Cullen's Nosology—were these diseases never to appear except in their most severe and acute form—and were all constitutions and temperaments affected in a like manner by disease, then it is granted that the general symptoms might be greatly depended upon ; but as this is far from being the case, the general symptoms, although of considerable service, are in most cases very imperfect criteria of the exact state of the internal organ. There are several diseases of the lungs and heart

which do not give rise to any general symptoms until they have reached the last stage ; as instances, may be mentioned, tubercles in the crude state, melanosis, calcareous depositions, chronic inflammation of the lungs and pleura, hypertrophy, dilatation and disease of the valves of the heart. In short, all the organic diseases commence so insidiously, that it is not till they have gone to an irremediable length that they give rise to general symptoms ; and if ever organic disease is to be cured, it must be done before it has gone so far as to tell upon the system. Besides, how seldom, comparatively speaking, do we meet with pure cases of pleuritis or pneumonia, as defined by Cullen. Are not the great majority of cases either partial, affecting only a small portion of the pleura or lung ; or a combination of pleuritis and pneumonia ; or of long standing, presenting hepatization, false membranes and effusions ; or all these morbid states, or only some of them, combined with tubercles, cavities, or a fistulous opening through the pleura ?

Another circumstance is the difference of temperament or constitution. A certain diseased state of an organ does not give rise to the same general symptoms in a dull phlegmatic temperament, as in a full sanguineous constitution. As examples of this, let us look at the progress of tubercles in different constitutions, or the insidious attacks of pleuritis or pneumonia which frequently occur in weak scrophulous patients.

There are many other circumstances which tend to modify the general symptoms. It is well known, that when pneumonia occurs during the course of fever, or after great surgical operations, the lungs have been frequently found destroyed by hepatization or suppuration, without the appearance of one of the general symptoms of the disease. In all chronic affections of the chest, the system becomes so habituated to the diseased action, as to change the character of the general symptoms, so much so, that the whole of one lung may be gradually destroyed, and yet the patient may breathe tolerably well. A lung may be thickly studded with crude

tubercles, and yet the person, up to a certain period, may appear in the enjoyment of perfect health.

These facts, and a great number of others which might be brought forward, show clearly that the general symptoms do not, in many cases, give us an idea of the actual state of the internal organ ; and also, that they are liable to be so modified or changed by temperament and other circumstances, as not at all to be relied on. It is very different with the *stethoscopic* or *physical signs*. They bring us at once to the actual state of the organ, independent of any accidental circumstance or temperament whatever. If a lung be tuberculated, the air does not pass so freely through it ; if there be a cavity in its substance, we must hear pectoriloquy or cavernous rattle ; if it be hepatized, then the respiratory murmur ceases to exist ; if we hear ægophony, we may be sure that there is effusion in the cavity of the pleura ; and so on. In all these cases the stethoscope is applied, as it were, to the organ itself, and the signs which are heard are caused either by a change in the structure of the organ, or the presence of a substance which does not exist in the natural state, and without such a change of structure, or the presence of some unnatural substance, these signs cannot by any possibility exist. From all this, it is evident that, while the stethoscopic signs point out the actual state of the organ, the general symptoms only indicate the effects which such a state produces on the system, and consequently, are secondary in point of value ; but it does not follow that they are not to be taken into consideration. On the contrary, they are of great importance, and ought never to be neglected ; but, at the same time, it is much more satisfactory to get at the state of the organ, in order that we may see how far it is capable of performing its functions, what part of it is affected, how, and to what extent it is affected. If the disease be pneumonia, it is surely of consequence to know whether one or both lungs be implicated ; if confined to one lung, whether it be in the upper or lower lobe ; and whether the diseased state be engorgement, hepatization, or suppuration. In many cases it is necessary to know all these circumstances.

By means of auscultation, we are enabled, as it were, to take a look at the lungs from time to time. A person treating diseases of the chest without the use of the stethoscope, is in the same predicament as one treating a surgical disease without taking the trouble to look at it, or touch it. The advantage we derive from the use of our eyes and fingers in surgical diseases, is exactly on a par with that which is derived from the use of auscultation in diseases of the chest. They are both physical signs, and afford a much more accurate knowledge of disease than any general symptoms can do.

It has been stated as an objection to auscultation, that although the use of the stethoscope may aid us in our diagnosis, yet it throws no light whatever on the treatment. Of all the objections which have been started, this one betrays the grossest ignorance and illiberality. Supposing it were true that the treatment of disease has not been improved by Lænnec's discovery, are we to reject an accurate knowledge of the nature and extent of a disease, because we have not a cure for it? The first step in the treatment of all diseases is the formation of an accurate diagnosis, because without this, supposing we do discover a remedy, we are unable to exhibit it with certainty a second time, or communicate the discovery to the world. But our diagnosis being perfect, we know the exact disease under treatment whether we can be of use or not, and are always prepared to take advantage of any remedy which may be discovered, and at once tell the form of disease in which it is useful. The reason why we have had so many boasted cures for consumption, is, that the authors of these remedies did not know the disease they were treating. Till within the last fifteen years, a considerable number of morbid conditions differing materially in their nature, situation, and mode of cure, were confounded under the term consumption. Tar vapour was found an efficient remedy in phthisis, while all the time, it was exhibited in cases of chronic bronchitis.

It is true that auscultation has not enabled us to discover any specific remedy; but the treatment of disease may be greatly improved without such a discovery. An accurate

knowledge of the morbid state of an internal organ, must always be of great service, not only in suggesting a mode of treatment, but also in preventing us from recommending useless or hurtful means. It is well known, that phthisis may be arrested in its progress by the influence of a warm climate, if had recourse to, before the tubercles have suppurated. It comes then to be a matter of great importance to ascertain the exact state of the lungs, in order to give an opinion as to whether the disease be in a state to be benefited by such a mode of treatment. In many cases of deranged action of the heart, it is of great consequence to know whether there be any organic lesion, or whether the affection be merely sympathetic. In cases of pleuritis or bronchitis, our mode of treatment is frequently changed, when we find that the disease has extended to the substance of the lungs. In cases of chronic bronchitis, presenting all the external symptoms of phthisis, does it not materially alter the treatment to know that there are no tubercles in the lungs, but that the disease is confined to the mucous membrane? In many surgical diseases, does it not frequently happen, that the question¹⁸³⁴ as to the propriety of performing an operation, depends upon the state of the lungs or heart? In a surgical, as well as in a medical point of view, is it not frequently of the greatest importance to know whether there be fluid in the cavity of the pleura, and on which side it exists; the exact time at which it begins to form, and the extent to which it has accumulated? The very fact of the stethoscope being so frequently called for at surgical consultations, is a satisfactory answer to these questions. There can be little doubt that accuracy of diagnosis not only improves our treatment of disease, but renders it more scientific.

Some have gone so far as to say, that the difficulty of acquiring a knowledge of auscultation is, to a certain extent, an objection to its use. It is true that it requires considerable study to become acquainted with the different morbid states, and their corresponding signs, and some time and practice in order to accustom the ear to the different sounds. All this, however, may be easily done. Those who start this as an objec-

tion, probably think that nothing new ought to be introduced into the science, unless it can be acquired in the closet, or picked up in conversation.

Several other objections have been urged against the use of the stethoscope, but they are of so trivial a nature as not to deserve notice. It may be remarked that all those who have refused to allow that there is any advantage to be derived from auscultation, are ready to grant that they have not studied the subject ; while on the other hand, no man who thoroughly understands the method, has ever offered the slightest objection to it.

I have endeavoured to show :—

1st.—That Lænnec's manner of examining the lungs and heart is founded on sound philosophic principles.

2d.—That the different stethoscopic signs are sure and invariable indications of the different morbid states, and that they point out the exact situation and extent of the disease.

3d.—That the general symptoms are in many cases far from being sufficient to enable us to form a correct diagnosis, that they seldom point out the situation, and never the extent, of the disease ; and,

4th.—That the treatment of the diseases of the chest has been greatly improved by the use of the stethoscope.

I will finish this short and imperfect essay, by relating a few cases illustrative of the above points, and of the various ways in which advantage may be derived from the use of the stethoscope.

CASE I.

ROBERT HUNTER, æt. 26, shoemaker, was admitted into the medical wards of the Glasgow Royal Infirmary, in the year 1826, under the charge of Dr Robertson, who was at that time one of the Physicians. Three months previous to his admission, while in the enjoyment of perfect health, was seized with pains shooting in various directions through left side of chest. These pains were not so severe as to prevent him from working, nor accompanied by much febrile excitement, till about three weeks after commencement of complaint, when he experienced a second attack. He was then obliged to take to his bed, in consequence of the severity of the pains; was bled from the arm, and had a blister applied to the affected side of his chest. During the two months previous to his admission, complained of occasional pains in chest, dyspnoea, and anasarca of extremities. At the period of his admission into the hospital, the following was his state:—A stout muscular man, countenance slightly livid and tumefied—extremities anasarcous. Subject to a troublesome cough, occasional severe pains shooting through different parts of left side of chest, and difficulty of breathing to such a degree that he cannot lie in the horizontal position. P. 100, of moderate strength.

Stethoscopic Indications.—Little or no respiratory murmur in the lower and back part of left side of chest. At the angle of scapula, ægophony was distinctly heard. The respiratory murmur puerile at the upper and anterior part of left side. Respiration good all over right side of chest.

He was bled from the arm, took calomel and squills, digitalis, and several other diuretics, but without any good effect. The symptoms increased in severity, and on examining him from time to time with the stethoscope, it was found that the ægophony soon disappeared, and also the respiratory

murmur. About a month after his admission into the house, the following were the stethoscopic indications :—No respiratory murmur whatever on left side of chest, except at the side of the vertebral column, and even there it is very weak. No ægophony. Fleishy sound on percussion all over left side. Extreme dyspnœa. Face livid and much swollen. P. quick, weak, and irregular. Much general anasarca. Reported moribund.

It is evident that this is a case of chronic pleuritis, accompanied with effusion of fluid. From the stethoscopic indications it is clear, that at the period of his admission, the effused fluid was small in quantity, as both ægophony and respiratory murmur could be heard. The fluid seems to have increased gradually, as indicated by the gradual disappearance of these signs. The respiration was at last only heard at the side of the vertebral column, where the lung was lying in a compressed state. It was clear also from stethoscopizing him at various times, that the substance of the left lung was unaffected, except by the compression, and that the right lung was healthy. This then is a man dying from effusion into one side of the chest, the opposite side being healthy, and also the lung of the same side. What is to be done? The only chance the man has is from the operation of paracentesis thoracis. A consultation was immediately called, and the operation agreed upon. The man was so far gone that he fainted on his way to the operation room, and required some brandy to bring him round. The dyspnœa was so great that he could not have lived many hours longer.

The operation was performed by Dr Anderson, who was at that time one of the Surgeons. About two Scotch pints of sero-purulent flaky fluid were evacuated, and the lips of the wound brought together with straps. The man felt himself so much relieved, that he could almost lie in the horizontal position. Spent the night comfortably. The wound did not adhere, and next day the dressings were wet from the evacuation of fluid. A considerable quantity of fluid continued to be evacuated daily. The respiratory murmur did

not return, and the man sunk gradually, and died on the fourteenth day after the operation.

On inspection, it was found that the left lung was compressed to a fourth part of its natural size, and firmly bound down to the vertebral column by a false membrane, or rather a series of false membranes, which adhered firmly to the pleura pulmonalis. They formed an organized mass three quarters of an inch thick, which could be easily separated into several layers; the layers nearest the lung were the most firmly organized. The pleura costalis was also covered by a false membrane, but it was much thinner. The cavity of the pleura contained a quantity of flaky sero-purulent matter. The substance of the lung, although greatly compressed, was otherwise sound. No disease was found in the right side of chest.

What were the points of importance ascertained by the use of the stethoscope in this case? They were, first, that there was an accumulation of fluid in the left side of the chest to such an extent, as to render one lung useless, and press also upon the heart so as to impede its action. Second, that the lung of the affected side was sound; and third, that the right side of the chest was sound. These were points of the very first importance in the treatment of the case. So much so, that the operation never could have been undertaken had they not been ascertained. Reasoning from the general symptoms alone, we never could have resolved on operating in this case. The general symptoms were cough, pain of breast, dyspnœa, lividity of countenance, and general anasarca. The cause of these symptoms was the sudden loss of the use of one lung. Now, had this lung been suddenly hepatized, the same general symptoms would have existed, because there would have been the same sudden loss of the use of a lung. We might, from a careful study of the history of the case, have suspected that there was fluid in the chest; but we could not have arrived at that degree of certainty necessary for undertaking so dangerous an operation. Besides, without the use of the stethoscope, we

could not have ascertained the state of the lung, or of the opposite side of the chest.

The man was greatly relieved by the operation, and lived fourteen days longer on account of it. The reason why the operation did not succeed, was the presence of the thick false membranes which bound the lung firmly down to the vertebral column. The lung was sound, but in consequence of these thick membranes it was impossible for it to expand. Had the operation been performed at an earlier period of the disease, before the false membranes had formed, then the lung would have dilated, and the man have recovered.

The operation of paracentesis thoracis has been greatly neglected, and the reason is, that till of late, our diagnosis was not sufficiently accurate to authorise us to perform it. But since auscultation has been introduced, it has been much more frequently practised. If this operation be performed at an early enough period, that is to say, before false membranes have formed, the lung, provided it be healthy, will easily expand, and although the pleura be diseased, yet its two surfaces will adhere. There is a great disposition in serous membranes to adhere, and if the fluid be allowed to escape, adhesion is very apt to take place. This operation has generally been unsuccessful, on account of its having been performed at too late a period.

The three following cases occurred in the Hospital at Tours, under the charge of M. Herpin. They are remarkable, in so far as they show that the operation of paracentesis thoracis is not in itself so dangerous as has been supposed; and that strong astringent solutions may be thrown into the cavity of the pleura, with safety and efficacy.

CASE II

PASQUET BENJAMIN, aged 25 years, was admitted into the Hospital at Tours, on the 1st of January, with small-pox. At the end of January, was seized with cough, dyspnœa, and pain of left side of chest. After examining him by means of the stethoscope, percussion, and measurement, M. Herpin was satisfied that there was effusion in the cavity of the pleura, and on February 1st, the operation of paracentesis thoracis was performed, and about a pint of pus mixed with flakes discharged. For several days the bed of the patient was soaked with pus, in consequence of the constant discharge. About a fortnight after the operation, the discharge became dark coloured and foetid. The edges of the wound were tumefied and inflamed, and the patient was in pain, and much agitated. Countenance pale and anxious; pulse quick; much general depression. He continued in this state till the middle of March, when he began to use kino and quinine internally, and have a decoction of kino with a few drops of the solution of the chlorate of lime injected daily into the wound. From this time he gradually improved, and on the 2d of May, the injections were discontinued.

On May the 6th, was seized with rigors, followed by pain and redness about the wound, from which a quantity of bloody matter was discharged by means of a catheter. He was put on low diet, and the injections repeated. He again improved, and the wound healed up. On the 2d July, he was presented to the Medical Society of Tours, when the following was the state of his chest:—wound healed; perfect resonance of right side of chest, and also of left side, except around the wound, where the sound was dull. Respiration good. Was stout, and in the enjoyment of good health.

CASE III.

A CHILD seven years of age was seized with pleuritis, after an attack of measles. M. Herpin being satisfied that there was fluid in the left side of the chest, made an opening into it by means of potassa fusa, and evacuated a quantity of purulent matter. The discharge continued for six weeks, during which time injections of barley water and honey were made use of, The wound then closed, but in consequence of difficulty of breathing and oppression ensuing, it was again opened, and the suppuration went on for several weeks. The parents confessed that they had formerly had syphilis. M. Herpin prescribed sarsaparilla and mercury, and in a short time the suppuration diminished; and the child was restored to health. In the year 1832,* (17 years after the performance of the operation), the person was in the enjoyment of good health—the chest was slightly deformed.

CASE IV.

A SOLDIER, 26 years of age, after several attacks of pneumonia, was found to have a quantity of fluid in the right side of his chest. M. Herpin operated on the 23d April, and discharged a quantity of very foetid pus. He took quinine internally, and made use of astringent injections, composed of a decoction of bark and chlorate of lime. The wound gradually healed. He became convalescent, and left the hospital on the 22d of May, perfectly cured.

CASE V.

HUGH BUNTIN, a stout healthy lad, 16 years of age, was admitted into the Glasgow Royal Infirmary, August, 7th,

* The date of the Paris Medical Gazette in which M. Herpin relates the cases.

1827, in consequence of a severe injury of the leg, which required immediate amputation. The double flap operation was performed above the knee. Dr M'Lachlan was the operator. The patient bore the operation well, but in the evening, secondary hemorrhage took place, which required the dressings to be removed, and some difficulty was found in stopping the bleeding, as it was a general oozing from the face of the stump. It was checked by means of pressure and cold applications; but not until he had lost 12 or 15 ounces of blood. He went on doing well, and at the first three dressings the stump seemed to be healing kindly. On the third day after the operation it was judged necessary to bleed him to the extent of 12 ounces, in consequence of his pulse being full and quick, his skin hot, and face flushed. On the 8th day after the operation, the stump opened up and assumed a flabby unhealthy appearance. His pulse was 144. He lost his appetite, and perspired considerably during the night. No cough nor pain of chest. On the 12th day, in consequence of observing that he had some cough, accompanied with expectoration of yellowish matter, it was thought proper to examine his chest with the stethoscope. To our astonishment, it was then found, that there were several large cavities in the upper part of the left lung, as indicated by pectoriloquy and cavernous rattle. In the lower part of the same lung there was no respiratory murmur, it was consequently supposed to be hepatized. P. 170, feeble. Hectic flush of countenance. Night perspirations. Cough and expectoration of thick greenish matter. These symptoms gradually increasing, he died on the 20th day after the operation.

On inspection, the left lung was found completely destroyed by inflammation—the lower lobe was hepatized, and of a dark red colour—the upper lobe was the seat of several large cavities communicating with each other, evidently the effects of suppuration of the lung. The other lung healthy.

This case shows very clearly that the general symptoms do not always lead to a correct idea of what is going on within. The only symptom at the commencement was the

quick pulse. The pulse never came down after the operation, and on the third day, venesection was performed, merely in consequence of the quickness of the pulse and general excitement. He never had the slightest cough, nor did he complain of pain in his chest, or of difficulty of breathing, till the cavities in the lungs had formed. So little suspicion was there of any disease of the chest, that he was not examined with the stethoscope, till he began to expectorate pus. The inflammation seems to have commenced on the second or third day after the operation, at which time, he was bled in consequence of general excitement, the chest not being suspected. The quick pulse, the flabby state of the stump, and the night perspirations could not be accounted for, till the state of the lungs was discovered. Had the chest been examined with the stethoscope at an earlier period, the inflamed state of the lungs would have been discovered in its first stage, and its progress towards suppuration observed. The quick pulse, and flabby state of the stump would have been easily explained, and the treatment would have been different.

This is by no means a rare case. Every hospital surgeon must have met with inflammation of the lungs, and consequent deposits of purulent matter, after amputations of the limbs. Without the use of the stethoscope, the disease is in general not discovered till it has gone the length of suppuration; and if treatment can be of any use in such cases, it must be at the commencement. This affection is similar to pneumonia, occurring in the course of typhus fever, where the only symptom of disease of the lungs, is the difficulty of breathing, and this is frequently supposed to be owing to some affection of the brain. In all these cases it is necessary to examine the chest on the slightest suspicion.

CASE VI.

ABOUT eight months ago, I was requested by my friend,

Dr Young, to examine the chest of a gentleman who laboured under suspicious pulmonary symptoms.

He was about 35 years of age, of a spare habit of body, and extremely irritable. He had been troubled with cough, and flying pains in different parts of left side of chest, for about four weeks. His pulse was natural. - No expectoration, excepting a small quantity of mucus in the mornings. Felt weak, but had not lost flesh, and was able to attend to his business. On examining his chest carefully with the stethoscope, we found that immediately below the right clavicle, (the side which was not before suspected,) the respiration was bronchial, and that the air scarcely entered the minute structure of the lung; the sound on percussion was also duller in this situation than on the opposite side. In other parts the lungs seemed healthy.

We concluded that there were tubercles in the upper part of the right lung, and recommended the gentleman to remove to a warm climate, as quickly as possible. His business however detained him, and his symptoms increased in severity. About six months after the first examination with the stethoscope, we examined him again, and found that there were several cavities in the upper part of the right lung, and also much consolidation of left lung. There was now no doubt about the nature of the case—the general symptoms were well marked. Incessant cough, with copious expectoration of purulent matter—night sweats—debility—hurried respiration—and extreme emaciation, left no doubt as to the probable result. He sailed soon after for the West Indies.

This is a most interesting case, in so far as it shows, that, by means of auscultation, phthisis may be detected at a very early period. When he was first examined with the stethoscope, he had been only a short time ill, and had no symptom of tubercles in the lungs. Without auscultation, at this period, we could not have supposed the disease to have been consumption—we could not have recommended the patient to leave his business and country, in quest of a better climate.

From what I have seen of consumptive cases in Italy, (and I examined a great number with the stethoscope during

a residence of nearly two years in that country,) I have no doubt that tubercles may be arrested in their progress by the influence of a warm climate ; but it is necessary to have recourse to it before the tubercles have softened and coalesced, so as to form vomicae. I believe that one or two small cavities may be cicatrized by the influence of climate ; but it so rarely happens that a cavity exists without tubercles in other parts of the lungs, which gradually form new cavities, that this event can scarcely be expected. The important point in the treatment of phthisis, is to ascertain the nature of the disease at an early period, for after it has gone a certain length, neither climate, nor any thing else, can be of use. To send a patient away, after cavities have formed, is only getting rid of him as incurable.

I might conclude by introducing a tabular view of the different morbid states of the lungs and heart, their physical or stethoscopic signs, and their general symptoms ; but I am afraid this would be exceeding the usual limits of probationary essays. For want of space I have carefully avoided minuteness, both as to the pathological states, and stethoscopic signs ; the catalogue of these however is not the less complete. The most minute changes of structure have been accurately described by authors, and classified according to the nature of the textures in which they occur, and almost all of them may be discovered during life by means of auscultation and percussion, aided by a knowledge of the general symptoms, history, temperament, habits, &c.

The pathological conditions of an organ being ascertained, the treatment becomes scientific ; but so long as we are ignorant of these, it must be speculative, and the illiterate practitioner may boast being as successful as the best informed. The more pathological anatomy is studied, the more evident it will become, that the only difference between surgical and medical disease, consists in the latter being covered from our view. Internal diseases are now studied and treated on the same principles as the diseases of the joints, the eye, the cellular membrane, or any other surgical affection ; and with what success, is well known.



